TIMOTHY C. HESTERBERG, Ph.D.

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Google

2628 31st Ave. W., Seattle, WA 98199-3338, 206-398-9207

timhesterberg@gmail.com, http://www.timhesterberg.net

Employment

- 2008-present: Google, Seattle. *Senior Data Scientist.*
- 1996-2008: Insightful Corp. (formerly MathSoft). *Senior Research Scientist.*
- 1990-1996: Franklin and Marshall College, *Assistant Professor.*
- 1994: Australian National University, *Visiting Fellow in Statistics.*
- 1988-1990: St. Olaf College, *Postdoctoral Fellow.*
- 1985-1988: Pacific Gas & Electric Co. *Operations Research Analyst.*

Education

- 1988, Ph.D., Stanford University, Statistics, adviser Brad Efron.
- 1983, M.S., Stanford University, Statistics
- 1981, Universität Bonn, Germany, Mathematics
- 1980, B.A., St. Olaf College, Mathematics

Honors

- 6 manager awards and 87 peer awards, Google. (87 is an extraordinary number; this includes statistical consulting, mentoring, statistical training, bias-busting training, and other citizenship.)
- Fellow of the American Statistical Association
- Performance Recognition Award, Pacific Gas & Electric Co.
- National Science Foundation Graduate Research Fellowship, Stanford University
- DAAD Fellowship, Universität Bonn, Germany (German version of Fulbright).
- *magna cum laude* with departmental distinction, ΦBK, St. Olaf College.

Publications

Google

Fan, R. and Hesterberg, T. and Liu, Y. and Zhang, L. (2018) Methods for Measuring Brand Lift of Online Ads, In *JSM Proceedings, Statistics in Marketing Section, American Statistical Association*, 891–905, http://www.eventscribe.com/2018/ASA-JSM/assets/pdf/867171.pdf.

Dain, O., Hesterberg, T., Mehta, Y. and Leavitt, L. (2012), Estimating Traffic for Millions of Queries in Real Time. In *Proceedings of the Statistical Computing Section*, 2404–2418, American Statistical Association.

Chan, D., Ge, R., Gershony, O., Hesterberg, T. and Lambert, D. (2010) Evaluating online ad campaigns in a pipeline: Causal models at scale. In *KDD '10: Proceedings of the 16th ACM SIGKDD international conference on Knowledge discovery and data mining*, 7–16. New York, NY, USA: ACM.

Statistics Education using Resampling

Chihara, L. and Hesterberg, T. (2018) *Mathematical Statistics with Resampling and R.* Wiley, 2nd edn. https://sites.google.com/site/chiharahesterberg.

Hesterberg, T. (2015) What teachers should know about the bootstrap: Resampling in the undergraduate statistics curriculum. *The American Statistician*, **69**, 371–386. http://doi.org/10.1080/00031305.2015.1089789.

Hesterberg, T. (2014) What teachers should know about the bootstrap: Resampling in the undergraduate statistics curriculum. *arxiv.org.* http://arxiv.org/abs/1411.5279. (The 2014 version includes additional material.)

Hesterberg, T. (2014) Bootstrapping for learning statistics. In *Sustainability in statistics education* (eds. K. Makar, B. de Sousa and R. Gould), Proceedings of ICOTS9 (9th International Conference on Teaching Statistics). Voorburg, The Netherlands: International Statistical Institute. http://iase-web.org/icots/9/proceedings/pdfs/ICOTS9_8B2_HESTERBERG.pdf.

Chihara, L. and Hesterberg, T. (2011) *Mathematical Statistics with Resampling and R*. Wiley, 1st edn. https://sites.google.com/site/chiharahesterberg.

Hesterberg, T., Moore, D. S., Monaghan, S., Clipson, A., Epstein, R., Craig, B. A. and McCabe, G. P. (2010) *Bootstrap Methods and Permutation Tests*. W. H. Freeman, fourth edition. http://content.bfwpub.com/webroot_pubcontent/Content/BCS_4/IPS7e/Student/Companion%20Chapters/ips_chap16.pdf. Chapter for *Introduction to the Practice of Statistics* by Moore, McCabe and Craig.

Hesterberg, T., Moore, D. S., Monaghan, S., Clipson, A., Epstein, R. and Craig, B. A. (2007) *Bootstrap Methods and Permutation Tests*. W. H. Freeman, third edition. http://bcs.whfreeman.com/ips6e/content/cat_040/pdf/ips6e_chapter16.pdf. Chapter for *Introduction to the Practice of Statistics* by Moore, McCabe and Craig.

Hesterberg, T. C. (2006) *Thinking and Reasoning with Data and Chance: NCTM Yearbook*, chapter Bootstrapping Students' Understanding of Statistical Concepts, 391–416. National Council of Teachers of Mathematics.

Hesterberg, T., Moore, D. S., Monaghan, S., Clipson, A. and Epstein, R. (2005) *Bootstrap Methods and Permutation Tests*. W. H. Freeman, second edition. http://bcs.whfreeman.com/ips5e/content/cat_080/pdf/moore14.pdf. Chapter for *Introduction to the Practice of Statistics* by Moore and McCabe.

Hesterberg, T., Monaghan, S., Moore, D. S., Clipson, A. and Epstein, R. (2003) *Bootstrap Methods and Permutation Tests*. W. H. Freeman. Chapter for *The Practice of Business Statistics* by Moore, McCabe, Duckworth, and Sclove.

Hesterberg, T. C. (1998) Simulation and bootstrapping for teaching statistics. In *Proceedings of the Section on Statistical Education*, 44–52. American Statistical Association.

Mathematics and Statistics Education

ASA Undergraduate Guidelines Workgroup (2014) *Curriculum Guidelines for Undergraduate Programs in Statistical Science*. American Statistical Association, Alexandria, VA. http://www.amstat.org/education/curriculumguidelines.cfm.

Hesterberg, T. C. (2008) It's time to retire "n >= 30". In *Proceedings of the American Statistical Association, Statistical Computing Section [CD-ROM]*. Alexandria, VA: American Statistical Association. http://www.timhesterberg.net/articles/JSM08-n30.pdf.

Hesterberg, T. C. (1995) The spider's spacewalk derivation of sin' and cos'. *The College Mathematics Journal*, **26**, 144–145.

Hesterberg, T. C. (1992) A mathematics clinic. In *Proceedings of the Section on Statistical Education*, 413–417. American Statistical Association.

L1-regularized Regression

Fraley, C. and Hesterberg, T. (2009) Least angle regression and lasso for large datasets. *Statistical Analysis and Data Mining*, **1**, 251–259. http://dx.doi.org/10.1002/sam.10021.

Hesterberg, T. C., N. H. Choi, L. Meier, C. Fraley. (2008) Least angle and L_1 penalized regression: A review. *Statistics Surveys*, **2**, 69–93 (electronic). http://dx.doi.org/10.1214/08-SS035.

Hesterberg, T. and Fraley, C. (2006) S-PLUS and R package for least angle regression. In *Proceedings of the American Statistical Association, Statistical Computing Section [CD-ROM]*, 2054–2061. Alexandria, VA: American Statistical Association.

Bootstrap Overview

Hesterberg, T. C. (2011) Bootstrap. *Wiley Interdisciplinary Reviews: Computational Statistics*, **3**, 497–526. http://dx.doi.org/10.1002/wics.182.

Hesterberg, T. C. (2007) Bootstrap. In *Wiley Encyclopedia of Clinical Trials* (eds. R. D'Agostino, L. Sullivan and J. Massaro). Wiley. http://dx.doi.org/10.1002/9780471462422.eoct392.

Bootstrap Methodology

Hesterberg, T. C. (2004) Unbiasing the bootstrap—bootknife sampling vs. smoothing. In *Proceedings of the Section on Statistics & the Environment*, 2924–2930. American Statistical Association.

Hesterberg, T. C. (2001) Bootstrap tilting diagnostics. In *Proceedings of the Statistical Computing Section*.

Hesterberg, T. C. (1999) Smoothed bootstrap and jackboot sampling. Research Department Technical Report 87, MathSoft, Inc. http://www.timhesterberg.net/articles/tech87-bootknife.pdf.

Hesterberg, T. C. (1999) Bootstrap tilting confidence intervals and hypothesis tests. In *Computer Science and Statistics: Proceedings of the 31st Symposium on the Interface* (eds. K. Berk and M. Pourahmadi), vol. 31, 389–393. Interface Foundation of North America, Fairfax Station, VA: Interface Foundation of North America.

Hesterberg, T. C. (1999) Bootstrap tilting confidence intervals. Research Department Technical Report 84, MathSoft, Inc. http://www.timhesterberg.net/articles/tech84-tiltingCI.pdf.

Hesterberg, T. C. (1997) The bootstrap and empirical likelihood. In *Proceedings of the Statistical Computing Section*, 34–36. American Statistical Association.

Hesterberg, T. C. (1997) Matched-block bootstrap for long memory processes. Research Department Technical Report 66, MathSoft, Inc. http://www.timhesterberg.net/articles/tech66-matchBlock.pdf.

Carlstein, E., Do, K., Hall, P., Hesterberg, T. C. and Künsch, H. R. (1998) Matched-block bootstrap for dependent data. *Bernoulli*, **4**, 305–328.

Carlstein, E., Do, K., Hall, P., Hesterberg, T. C. and Künsch, H. R. (1995) Matched-block bootstrap for dependent data. Statistics Research Report SRR 017-95, Center for Mathematics and its Applications, The Australian National University, Canberra, Australia.

Computationally Efficient Bootstrap Methods

Hesterberg, T. C. (2002) Performance evaluation using fast permutation tests. In *Proceedings of the Tenth International Conference on Telecommunication Systems* (ed. B. Gavish), 465–474. American Telecommunication Systems Management Association. Monterey, CA.

Hesterberg, T. C. and Ellis, S. J. (1999) Linear approximations for functional statistics in large-sample applications. Research Department Technical Report 86, MathSoft, Inc. http://www.timhesterberg.net/articles/tech86-linear.pdf.

Ellis, S. J. and Hesterberg, T. C. (1999) Computation of weighted functional statistics using software that does not support weights. Research Department Technical Report 85, MathSoft, Inc. http://www.timhesterberg.net/articles/tech85-weightedFunc.pdf

Hesterberg, T. C. (1997) Fast bootstrapping by combining importance sampling and concomitants. In *Computing Science and Statistics: Proceedings of the 29th Symposium on the Interface* (eds. E. J. Wegmand and S. Azen), vol. 29, 72–78. Interface Foundation of North America, Fairfax Station, VA: Interface Foundation of North America.

Hesterberg, T. C. (1996) Control variates and importance sampling for efficient bootstrap simulations. *Statistics and Computing*, **6**, 147–157.

Hesterberg, T. C. (1995) Tail-specific linear approximations for efficient bootstrap simulations. *Journal of Computational and Graphical Statistics*, **4**, 113–133.

Hesterberg, T. C. (1994) Tail-specific linear approximations for efficient bootstrap simulations. In *Proceedings of the Conference on the Interface between Computing Science and Statistics* (eds. J. Sall and A. Lehman), vol. 26, 472–481. Interface Foundation of North America, Fairfax Station, VA: Interface Foundation of North America.

Hesterberg, T. C. (1994) Saddlepoint quantiles and distribution curves, with bootstrap applications. *Computational Statistics*, **9**, 207–212. Figures are in volume 10(2), page 193.

Hesterberg, T. C. (1994) Efficient bootstrap methods in computer vision. In *Proceedings of the NSF/ARPA Workshop on Performance vs. Methodology in Computer Vision*, 167–175.

Hesterberg, T. C. (1993) Control variates and importance sampling for the bootstrap. In *Proceedings of the Statistical Computing Section*, 40–48. American Statistical Association.

Control Variates

Hesterberg, T. C. and Nelson, B. L. (1998) Control variates for probability and quantile estimation. *Management Science*, **44**, 1295–1312.

Hesterberg, T. C. (1998) Discussion of D. Firth and K. E. Bennett: Robust models in probability sampling. *Journal of the Royal Statistical Society, Series B*, **60**, 49–50.

Importance Sampling

Hesterberg, T. C. (1996) Estimates and confidence intervals for importance sampling sensitivity analysis. *Mathematical and Computer Modeling*, **23**, 79–86.

Hesterberg, T. C. (1995) Weighted average importance sampling and defensive mixture distributions. *Technometrics*, **37**, 185–194.

Hesterberg, T. C. (1991) Weighted average importance sampling for response surface estimation. In *Proceedings of the Statistical Computing Section*, 144–149. American Statistical Association.

Hesterberg, T. C. (1991) Weighted average importance sampling and defensive mixture sampling. Tech. rep., Statistics Department, Stanford University.

Hesterberg, T. C. (1991) Importance sampling for Bayesian estimation. In *Computing and Graphics in Statistics* (eds. A. Buja and P. Tukey), vol. 36 of *Volumes in Mathematics and Its Applications*, 63–75. Springer Verlag. Institute for Mathematics and Its Applications.

Hesterberg, T. C. (1988) *Advances in Importance Sampling*. Ph.D. thesis, Statistics Department, Stanford University.

Hesterberg, T. C. (1987) Importance sampling in multivariate problems. In *Proceedings of the Statistical Computing Section*, 412–417. American Statistical Association.

Seismic Deformation Estimation

Hesterberg, T. C., Stanford, D. C. and Merritts, D. J. (2000) Tectonic deformation estimation using stream gradients: Nonparametric function estimation from difference data using splines and conjugate gradients. In *Computing Science and Statistics*, vol. 32, 246–254.

Hesterberg, T. C. and Merritts, D. J. (1995) Tectonic deformation estimation using stream gradients: Nonparametric function estimation from difference data. In *1995 Proceedings of the Section on Physical and Engineering Sciences*, 85–90. American Statistical Association.

Merritts, D. J. and Hesterberg, T. C. (1994) Stream networks and long-term surface uplift in the New Madrid seismic zone. *Science*, **265**, 1081–1084.

Electric Load Forecasting

Papalexopoulos, A. D. and Hesterberg, T. C. (1989) A regression based approach to short-term system load forecasting (with discussion). *IEEE Transactions on Power Systems*, **5**, 1535–1547.

Papalexopoulos, A. D. and Hesterberg, T. C. (1989) A regression based approach to short-term system load forecasting. In *Proceedings of the Summer 1989 Power Industry Computer Applications Conference*, 414–423.

Hesterberg, T. C. and Papalexopoulos, A. D. (1988) Short term electric load forecasting using linear regression. In *Proceedings of the Business and Economic Statistics Section*, 608–612. American Statistical Association.

Other Applications

Hesterberg, T. C. (1999) CFAR detection with non-Gaussian and dependent data. In *27th AIPR Workshop: Advances in Computer-Assisted Recognition* (ed. R. Mericsko), vol. 3584, 52–63. SPIE.

Hesterberg, T. C. (1998) Comments on the CFAR literature. Research Department 71, MathSoft, Inc., 1700 Westlake Ave. N., Suite 500, Seattle, WA 98109.

Hesterberg, T. C. (1998) CFAR detection with non-Gaussian and dependent data. Research Department Technical Report 72, MathSoft, Inc. `http://www.timhesterberg.net/articles/tech72-CFAR-Gaussian.pdf`.

Hesterberg, T. C. (1998) A case study in CFAR target detection. Research Department Technical Report 73, MathSoft, Inc. `http://www.timhesterberg.net/articles/tech73-CFAR-Case.pdf`.

Zhuang, F., Vojdani, A. F., Raggio, J. H., Hesterberg, T. C. and Sickman, D. (1991) Ramping fuel cost of generating units. In *Proceedings of the 1991 EPRI Heat Rate Conference*, 6A–15–6A–27. Palo Alto, CA: Electric Power Research Institute.

Other Methodology

Hesterberg, T. C. (2005) Staggered Aitken acceleration for EM. In *Proceedings of the American Statistical Association, Statistical Computing Section [CD-ROM]*, 2101–2110. Alexandria, VA: American Statistical Association.

Hesterberg, T. C. (1999) A graphical representation of Little's test for MCAR. Research Department Technical Report 94, MathSoft, Inc. `http://www.timhesterberg.net/articles/tech94-mi-little.pdf`.

Hesterberg, T. C. (1999) Aitken and step-lengthening methods for EM. Research Department 95, MathSoft, Inc., 1700 Westlake Ave. N., Suite 500, Seattle, WA 98109.

Hesterberg, T. C. (1998) Combining multiple imputation t, chi-square, and f inferences. Research Department Technical Report 75, MathSoft, Inc. http://www.timhesterberg.net/articles/tech75-mi-inference.pdf.

Book Reviews

Hesterberg, T. C. (2004), Review of "Introduction to Stochastic Search and Optimization: Estimation, Simulation, and Control" by James C. Spall, *Technometrics*, **46**(3), 368–369.

Hesterberg, T. C. (2002), Review of "Monte Carlo Strategies in Scientific Computing" by Jun S. Liu, *Technometrics* **44**(4), 403–404.

Hesterberg, T. C. (2000), Review of "Resampling Methods: A Practical Guide to Data Analysis," by Phillip I. Good. *Journal of the American Statistical Association*, **95**(242), 1376–1377.

Hesterberg, T. C. (1993) Review of "Statistical Models in S" by J. Chambers and T. Hastie. *Technometrics*, **35**(2):227.

Manuals

Insightful Corporation, (2002, 2007) S-PLUS Resample Library User's Manual, Seattle, WA.

Chihara, L. M., Snow, G. L., and Hesterberg, T. C. (2006). *S-PLUS Guide for Moore's The Basic Practice of Statistics*, fourth edition. W. H. Freeman.

Snow, G. L., Chihara, L. M., and Hesterberg, T. C. (2005). *S-PLUS Guide for Moore and McCabe's Introduction to the Practice of Statistics*, fifth edition. W. H. Freeman.

Insightful Corporation (2002), S+SEQTRIAL 2 User's Manual, Seattle, WA.

Schimert, J., Schafer, J.L., Hesterberg, T., Fraley, C. and Clarkson, D.B., (2001) *Analyzing Data with Missing Values in S-PLUS*, Insightful Corporation, Seattle WA.

Other

Hesterberg, T. (2008), *Efficient Programming in R*, http://www.timhesterberg.net/articles/Efficient.R

Braverman, A., Hesterberg, T., Minnotte, M., and Symanzik, J. (2003), editors, Computing Science and Statistics, 35. Interface Foundation of North America, Inc., Fairfax Station, VA http://www.galaxy.gmu.edu/interface/I03

Hesterberg, T. (2002), *Efficient Programming in S-PLUS*, http://www.timhesterberg.net/articles/EfficientSplus.txt

Software

- `resample` R package
- `splus2R` R package
- `dataframe` R package; this is no longer on CRAN because it has largely been subsumed into base R. It dramatically improved speed and memory use, e.g. making 3 copies of data instead of 8. My findings prompted R-core (Luke Tierney and others) to improve memory management in R.
- faster data frames in S-PLUS
- `S+GLARS`
- `S+SeqTrial`
- `S+MissingData`
- `S+Resample`
- `colMeans`; I wrote the original package, later incorporated into S+ and R.

Patents

- Discovery of digital goods in an online marketplace, US20130103550 A1, 2013, http://www.google.com/patents/US20130103550.
- Identifier mapping from joined data, US8364682 B1, 2013, http://www.google.com/patents/US8364682.
- Evaluating statistical significance of test statistics using placebo actions, US8346710 B2, 2013, http://www.google.com/patents/US8346710.

Professional Activities

ASA Sections

- Secretary/Treasurer, Statistical Computing Section, 2014–2015.
- Council of Sections Governing Board Vice Chair, 2010–2012.
- Chair-Elect, Chair, Past-Chair, Statistical Computing Section, 2004-2006.
- Publications Officer, Statistical Computing Section, 2003–2004.
- Program Chair, Statistical Computing Section, 2002; Program Chair Elect 2001.
- Secretary, Nonparametric Statistics Section, 2002.
- Treasurer, Nonparametric Statistics Section, 2001.
- Chaired group to create Statistical Education Section home page.

ASA Chapters

- Treasurer, Puget Sound Chapter, 2008–2012.
- Council of Chapters Representative, 2002–2006, 2010-2011
- Chair, Council of Chapters (COC) Traveling Course Committee, 2002–2003.
- Traveling Course Committee, 2000–2001.
- President of Puget Sound Chapter, 1997–1999.

Other ASA Service

- Education Workgroup on Undergraduate Curriculum Guidelines, 2013–2014.
- Scientific and Public Affairs Advisory Committee, 2007-2009.
- Subcommittee on Website Evaluation, 2007.
- Co-chair, Local Arrangements Committee for the Joint Statistical Meetings (JSM), 2006.

Other Service

- Curriculum team (core team), International Data Science in Schools Project, `http://www.idssp.org`, 2018–19
- Nominating Committee, AAAS Section on Statistics, 2017–2020, chair 2019-2020.
- Executive Board, National Institute of Statistical Sciences, 2013–2020.
- Executive Board, Interface Foundation of North America, 2002–2006, 2010–2020.
- President, Interface Foundation, 2017–2020.
- Secretary, Interface Foundation, 2004–2007, 2010-2017.
- "A Common Vision for the Undergraduate Mathematics Program in 2025" workshop, 2015.
- Organized sessions in 1994, 1995, 1997, 1998, 2001, 2003, 2006, 2007, 2008 for the Conference on the Interface between Computing Science and Statistics and/or JSM.
- Associate Editor, Journal of Computational and Graphical Statistics, 2000–2012, 2016.
- Referee for numerous journals.

Outreach

- *Bootstrap Methods and Permutation Tests*: 40 short courses and workshops, including 18 sponsored by the ASA: CE program at JSM 04, 05, 07, 11, seven at ASA chapters, ASA FDA workshop 2009, JSM 06 IOL, JSM 06 AP Statistics, ASA CSP 16, 17, 19; and one for SIAM 2018.
- *Bootstrap for statistics education* talks: AP Statistics graders, Northwestern, Chicago, Waterloo, St. Olaf, Illinois, Wisconsin, CO School of Mines, Cornell, Temple, Berkeley, UNLV, Purdue, Michigan, McGill, NCSU, Vanderbilt, UCSD, UNC, Nebraska, UCLA, JSM 14, ICOTS 14, ... (others before 3/2014).
- *Statistics and Big Data at Google* talks: these use Google as a hook to get students excited about statistics. Attendance is often huge, e.g. 400+. Johns Hopkins, University of Padua, Carleton, Iowa State, Iowa, CO School of Mines, Cornell, Berkeley, UNLV, Purdue, Michigan, McGill, UMBC, Chicago, NCSU, UCSD, Washington, Florida, U of British Columbia, Joint Mathematics Meetings, MIT, Harvard, Duke, ASA QPRC conference, St. Olaf, UNC, Nebraska, Pomona, LA R User's Group, College of the Canyons, ... (others before 3/2014).
- *Careers in Statistics/Data Science* talks: NISS webinar, Texas A&M webinar, NSF Data Science workshop, IMS New Researcher's conference, UW career panel, Puget Sound ASA, high school groups.
- Taught *Mathematics Practicum*, where student teams solve real problems for local industry, government, and non-profit organizations.

Fun

Biking, running, Sierra Club, bridge, board games, teaching kids to make water bottle rockets, paddleboats, and torches, and taking high school students to set up computer labs in Guatemala, Ecuador, and Costa Rica. See `http://www.timhesterberg.net`

There is a humorous version of my resume at `http://www.timhesterberg.net/home/bio`.